

First non-Provisional Patent application:
Self powered electronically controlled mixing valve -- Inventor: Eric Delangis

WHAT IS CLAIMED:

1. A self powered electronically controlled mixing valve comprised of:
 - a hot fluid source input fitting; a cold fluid source input fitting, two mixed output fittings, a piston style fluid mixing element with an integral thermostatic temperature control element for fail-safe maximum temperature limitations such as in anti-scald protection;
 - an electronically operated drive means to control said mixing valve to adjust output temperature;
 - an electronic control module coupled to said mixing unit, and enclosed in a protective housing, that includes a microcomputer, a control program stored in said microcomputer, a temperature sensor for measuring mixed fluid output temperature, a drive motor for the means to control said fluid mixing element, power generating capability, sound generation capability and RF, IR or wired communications capabilities to communicate with a main control unit;
 - an electromechanical power generating device positioned in the fluid flow of said mixing unit and driven by the fluid moving through said device so as to produce sufficient voltage and current to power the electronic control module;
 - an electronic control module that develops it own operating power by means of flowing fluid that eliminates the need for a battery and the problems associated with battery failures and battery replacement;
 - a mixing valve assembly specifically optimized for retrofit installations wherein any existing faucet can be adapted to an electronically temperature controlled faucet

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without removal or replacement and specifically wherein said existing faucet controls the water flow and flow rate by means of existing faucet controls or handles;

said microcomputer being operable under control of said program to operate fluid mixing element based upon changes in output mixed temperature to control the temperature of the mixed fluid output;

said microcomputer being operable under control of said program to operate fluid mixing element based upon changes in output mixed temperature to control the temperature of the mixed fluid output when the incoming hot and cold fluid sources may be misconnected, i.e. swapped, when the system is installed;

said microcomputer being operable under control of said program to operate fluid mixing element based upon changes in output mixed temperature to control the temperature of the mixed fluid output when the incoming hot and cold fluid sources pressure and/or temperature fluctuate due to external environmental effects or by usage of other fluid fixtures such as flushing toilets or turning on other faucets as in the case of a water faucet application;

said microcomputer being operable under control of said program to generate audible tones to signal the user that the desired temperature has been attained;

a main control unit that contains a microcomputer that communicates with mixing valve electronic control module via a uni-directional or a bi-directional RF, IR or wired signaling scheme, and said main control unit sends and receives temperature information to and from electronic control module of mixing valve unit and displays temperature and allows user to change temperature at any time;

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an electronic main control unit that can be located anywhere near or far from the output fluid source and that can be powered by either AC mains power or a battery source, and that provides a means to change batteries, and of water proof design so as to prevent damage from controlled fluids;

an electronic main control unit with touch sensitive surface that allows the user to control the mixed output fluid temperature by pressing on the surface of the Main Control Unit along a varying temperature graphic depicting the relative fluid temperature and that displays the actual fluid temperature on its surface, such touch sensitive areas are located under the surface decal of the main control unit (2) approximately every one eighth inch to provide the user with sufficient gradations in temperature control, additionally, main control unit microcomputer provides for finer temperature adjustment by holding down on a single spot on said surface graphic while the displayed temperature slowly increases, and when the desired temperature is reached, removing the finger;

an electronic main control unit with an infrared sensor device to detect the presence of an object such as a lever or another mechanical device or a user's hands to automatically turn on the fluid flow by means of sending control information over said RF, IR or wired communication link to the electronic control module of the mixing unit which in turn controls a solenoid device to start the fluid flow.

2. A self powered electronically controlled mixing valve of claim 1 with a single flow control solenoid placed in line with power generator turbine, either before of after, and actuated by electronic control module to turn fluid flow on and off under command from main control unit that incorporates an infrared detection device to automatically

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- turn on and off fluid flow upon detection of some physical obstruction such as a mechanical device or a user's hands placed in close proximity of main control unit;
- a solenoid device of such a design that allows varying amounts of fluid flow through the system by controlling the amount that the solenoid device opens and that is under control of the electronic control module and main control unit;
- a timeout to shut off the fluid automatically after a predefined period of time has elapsed from the time that the device is activated, or after a predefined period of time after the initiating action that caused the device to activate has been removed, such as after the user removes their hands from the proximity of a sink or the removal of some other mechanical activation element.
3. A self powered electronic control module of the type of claim 1 that can be adapted to operate existing fluid mixing valve designs from various manufacturers, with appropriate mechanical adaptation for proper operation of such existing faucets and other devices as shower faucets that have a single mixed water output fitting, so as to be useful as an integral upgrade for existing mixing valve designs for said various manufacturers to offer electronic functionality to their respective product lines.
4. A self powered electronically controlled mixing valve of claim 1 that mixes fluids of varying viscosity to produce a mixed output of a desired viscosity; such an application is implemented utilizing the full displacement type turbine and monitoring turbine rotational speed with said microcomputer; and a calculation is made by said microprocessor to determine corrections to mixing valve position; with viscosity mixing can be performed in conjunction with said temperature sensor; said desired viscosity

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being controlled by the main control unit with user graduations defined in volume/seconds units such as cubic centimeters per second instead of a temperature scale.

5. A self powered electronically controlled mixing valve of claim 1 that mixes fluids based upon a specified ratio; said ratio being controlled by the main control unit with user graduations defined in percentages instead of temperature or viscosity.
6. A self powered electronically controlled mixing valve of claim 1 with a voice recognition feature added to either the mixing unit or the main control unit that allows user to set the desired temperature verbally.
7. A self powered electronically controlled mixing valve of claim 1 incorporating a stepper motor, servo motor or any other suitable electronically controlled device to operate and control the fluid mixing element.